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STUDENT REPORT

PLOESTI - A FRAMEWORK FOR DISCUSSION

MAJ JAMES E. BOATWRIGHT 84-0260

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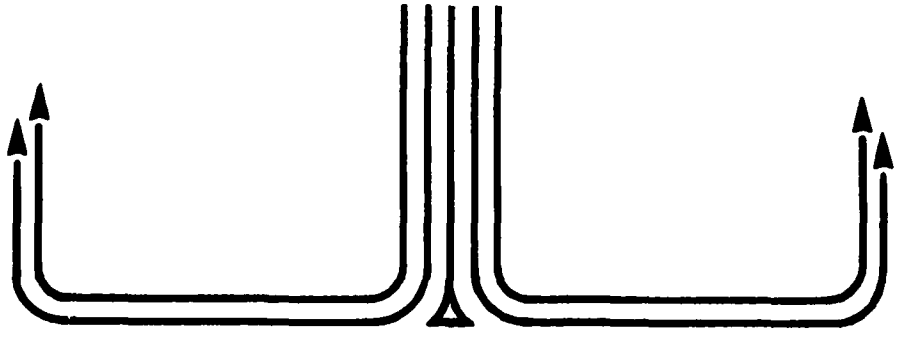

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An analysis of the 1 Aug 1943 Allied bombing raid on the Ploesti, Rumania oil refineries in light of the principles of war as described in Air Force Manual 1-1, United States Air Force Basic Doctrine.

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INTRODUCTION

The purpose of this paper is to provide a systematic method of analyzing one of the most daring and, in retrospect, one of the most tragic and indecisive air-to-ground battles in the European theater in World War II. I refer to the Allied attempt to destroy Hitler's primary source of petroleum, the oil complexes of Ploesti, Rumania, in the summer of 1943.

The raid on Ploesti was boldly conceived in that it employed new tactics that had not been tested in combat and was a highly complex operation that required the utmost in crew skill and courage. The action resulted in five Medals of Honor being awarded, the most ever for a single military operation (6:188). The raid was unfortunate in that so many planes and lives were lost without achieving the ultimate objective of depriving Germany of enough oil to seriously hamper her warmaking capability.

The methodology for studying the Ploesti raid will be to examine the mission's planning and execution through the use of the principles of war as listed in the draft edition of Air Force Manual (AFM) 1-1. Accounts of the battle were screened to see if they contained examples of the use or nonuse of the principles of war by both the Americans and the Germans. Sources included units' histories, eyewitness accounts and official

documents as well as other narrative accounts of the mission.

The paper consists of three main chapters. Chapter Two is a detailed account of the raid, including the background, planning, and execution of the raid. The chapter concludes with a description of the effects of the raid on the Germans.

Chapter Three analyzes each principle of war and cites examples of how the author interpreted whether or not that particular principle was used or violated by each side. Some principles were absolutely necessary to the success of the mission. For example, surprise and offensive were key principles of the Americans and many authorities feel that lack of surprise was the key factor in the failure to inflict enough damage on the target. On the German side, the emphasis on mass in the construction of their defensive systems lessened their vulnerability to enemy attack. Other principles played lesser roles in the general outcome of the battle.

The fourth chapter is a compilation of questions to be used in a seminar or guided discussion. The questions are designed to induce critical thought and discussion of the principles of war in the Ploesti raid and the value of the principles to contemporary military theory and doctrine. All of these three main chapters are written to stand alone.

Chapter Two

NARRATIVE

The Allied bombing raid on the oil refineries at Ploesti, Rumania on Sunday, 1 August 1943 was a daring event in the history of airpower. It was conceived as a long overdue follow-up to the 11 June 1942 attack by 12 B-24 "Liberators" led by Col Harry A. Halverson that was designed to destroy one third of Hitler's oil supply. Unfortunately, Halverson's raid had achieved only minimal success and did little damage to the refineries. The most significant result was the demonstration that the target could be reached from bases in North Africa. Twelve of the thirteen planes launched actually reached the target area and all of those were safely recovered with no loss of life (2:14). Thus, a follow on mission of this type was proven to be feasible.

Just such a mission, "Operation Tidal Wave", was a direct result of the meeting between Prime Minister Churchill and President Roosevelt at Casablanca, Morocco in January of 1943. The Casablanca Directive laid the guidelines for future British-American bombing strategy against the Nazis (3:154). The priorities for Allied attacks were

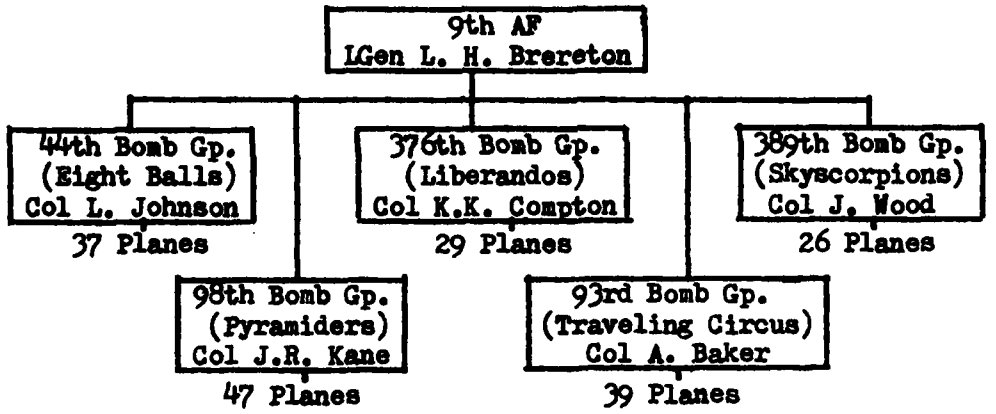
1. German submarine construction yards,
2. aircraft industry,
3. transportation,

4. oil installations, and

5. other targets of enemy war industry.

A total of five bomb groups were scheduled to make the next attack on Ploesti. Three of these groups were already in Libya supporting the effort against Rommel. These units made up the 9th Air Force. They were the veterans 98th and 376th Bomb Groups and the newly formed 389th Bomb Group. Two bomb groups, the 44th and 93rd, were transferred from 8th Air Force in England to supplement the Ploesti effort.

All five groups were under the command of LGen Lewis H. Brereton and flew B-24 Liberators. The organizational structure was as follows:



NOTE: Number of planes are those that took off on the Ploesti raid.

The conception and planning for the Ploesti raid fell to one of Gen Hap Arnold's brightest staff officers, Col Jacob E. Smart. He came up with the novel approach that the attack should be made at low-level in order to try to achieve surprise over the defenders even though the B-24 was designed as a high altitude bomber (3:157). But Smart saw several advantages best explained in the following quote:

> The ideal (low-level bombing) seemed to have everything. It was a cunning psychological trick. Everyone, including the Germans, knew the American monomania for high-level attack by heavy bombers. An unprecedented low-level strike would permit the utmost precision bombing of the vital pinpoints in the refineries and score with the most explosives. It would spare civilians and raise American esteem among the subject peoples of fascism. It would reduce losses of men and planes by affording flak gunners low fleeting targets. By hugging the ground, the B-24's would cheat German pursuit planes of half their sphere of attack. Moreover, the stratum nearest the ground was the blind angle for radar detection. And Liberators that were mortally hit in battle would have a better chance to skid land than those that were crippled high in the sky. Before he told anyone of the wild idea, Smart turned devil's advocate and tried to upset his own reasoning. 'Of all aircraft, there is probably none less suited to low-level work than the B-24,' he said to himself. 'To the man on the ground it appears as though he could knock it down with a rock.' He took off his horns and answered, 'The quality of our B-24 pilots is pretty high. With special training they could fly formation on the deck and make it work. Moreover, for the first time in heavy bombing experience the machine gunners in the Liberators will be able to fight the flak men, not just the fighter craft. Previously, flak crews have been subjected only to an occasional nearby bomb burst or straffing by fighters. How would they behave in the face of hundreds of fifty-calibers firing from the low flying Liberators?' Each question produced a satisfactory answer. The revolutionary low road was the right road to Ploesti (2:38).

The final decision as to what type of attack, high or low-level, was that of LGen Brereton. Correspondence from BGen Uzal G. Ent, Commander of 9th Bomber Command, to his immediate superior, LGen Brereton, recommended the high-level option citing that, among other things, crew morale would be higher and the probability of failure to locate targets due to enemy created smoke screens would be less. Further, the simplicity of the high altitude plan and the fact that no special training was necessary would increase the chance of successful mission accomplishment. As for the low-level attack, Ent reasoned that it would be difficult to pick out targets even with good visibility. He also, more importantly,

thought the probability of 71% greater losses at low-level than high dictated the high level option (8:1). However, Brereton opted for low-level, believing that total destruction of the targets was necessary to have the desired negative effect on the Nazi war effort. The best opportunity of achieving that destruction lay in a low-level sneak attack (9:1).

Once the decision was made, Brereton's staff had to undertake the training of the crews and detailed planning of the mission. The training was going to be extensive and compressed into a relatively short period of two weeks or less. The Royal Air Force assisted the Americans and constructed two mock targets. One was a table model for the crews to study; the other was a mock target constructed to scale in the Libyan desert. The flyers made practice attack runs at low altitude and on 28 July, just 4 days prior to the strike, the planes destroyed the dummy target in two minutes. Destroying this dummy target was no small feat - it covered some 40 square miles (3:160).

Pre-raid training briefings were numerous and detailed. They emphasized that

1. Rumanian flak crews wouldn't fire on the attackers,
2. the interceptor pilots would be caught by surprise,
3. since the attack was on Sunday, there would be fewer defenders on duty than normal,
4. most of the air defense radars around Ploesti faced south anticipating an attack from that direction, and
5. the combination of the low-level approach and enforced radio silence would insure the element of surprise (6:189).

The mission planners, in fact, studied the effects of surprise in great detail. The reasoning went like this: Surprise will not be total. Rather, since the Nazis knew that the Americans had B-24's in Libya and that B-24's were designed for high-level bombing, they would be expecting and subsequently defend for a high altitude attack. The low-level attack would then render the high-level defenses inefficient. Intelligence indicated that Ploesti was to be defended by heavy and light AA guns, machine guns, blocking balloons around the perimeter of the target, fighters and smoke screens. It was anticipated that the enemy's response to a presumed high-level attack would be to

1. send up fighters,
2. create a smoke screen,
3. hoist blocking balloons, and
4. man guns.

If the planes then attacked at low-level the scenario would go like this: the heavy guns would be inefficient for low flying targets. The use of the fighters on a low-level attack would disorient the fire of the light AA guns resulting in them shooting down their own aircraft. In addition, fighters would be less maneuverable at low-level. Balloons were not considered effective since the cables were not usually dense enough to keep a heavy aircraft like a B-24 from flying through it. By contrast, the balloons would pose a threat to the light defending fighter planes (9:1).

Intelligence further indicated that "the fighter defenses are not strong and the majority of the fighters will be flown by Rumanian pilots

who are thoroughly bored with the war." (3:160) The Americans expected that there would be only 80 heavy AA guns and 110 light AA guns. Plus there was a cautious optimism that the Rumanian gunners would leave their gun positions and head for the bomb shelters when threatened with the low flying B-24's. As will be shown later, most of this intelligence was woefully inadequate.

The timing of the attack was also analyzed in detail. The choice was between an attack at dusk or one at noon. Some strong points for a dusk attack were that the attackers could come in out-of-the-sun and this approach would hamper the visibility and effectiveness of the ground gunners. It was also felt that there would be less danger from enemy fighters once darkness had set in and the planes were headed home. The weak points of a dusk attack were primarily that airplanes in trouble would have less probability of successfully landing in night conditions and that the smoke screens would be more effective at dusk than at noon. Also, with a dusk attack the planes could not return to Libya due to an increase amount of dust in the air at night which made night operations impossible. They would have to land at alternate bases. This was a negative morale factor for most of the crews. Probably the key factor in favor of noon was that the smoke screens would be less of a problem then and this would directly contribute to getting more bombs directly on target (11:1).

At 0700 local time on Sunday, 1 August 1943, the 9th Bomber Command took off to wreak destruction on the oil refineries of Ploesti. The total force consisted of 178 B-24's each carrying 3,100 gallons of fuel and

4,300 pounds of ordinance, the total of which exceeded the maximum load allowance of the planes. It took about one hour for the planes to mass in formation and begin the seven hour journey to the target. The planes crossed the Mediterranean at low-level headed for the island of Corfu. Here they turned east to head overland to Rumania. As they approached the Pindus Mountains in Albania they climbed to altitude to clear the 9,000 foot peaks. Here the first fateful mistake of the mission occurred. Because of dense clouds the planes lost sight of each other and broke into separate groupings. One grouping, consisting of the 376th and 93rd Bomb Groups, climbed to 16,000 feet to go over the clouds. The other grouping, which included the 44th, 98th and 389th Bomb Groups, penetrated the clouds at 12,000 feet. Due to differences in wind speed and direction at these different altitudes, the two groupings drifted further apart. Because of the strict radio silence there was no way to reunite the planes. So the planes were going into what was planned as a coordinated, synchronized attack without any coordination at all. At this time, some of the crews spotted old enemy fighters below them. These planes posed no threat because they couldn't operate at the higher altitude, but seeing them did alert the Americans that the element of total surprise had been lost.

The first grouping to reach the first initial point(IP), the town of Pitesti, was the 93rd and 376th. The second grouping went over Pitesti after them, but still without visual contact of them. The 389th left the 44th and 98th at this point to make it's planned run on a separate refinery at Campina, approximately twenty miles north of Ploesti.

The 44th and 98th continued on the planned course to the second IP at Targoviste. By now all the planes were at the attack altitude of 500 feet. (Refer to the attached maps of the attack both "as planned" and "as executed" located at the end of this chapter.)

When the 93rd and 376th Bomb Groups reached Targoviste, the most fateful mistake of the day was made. The lead pilot mistook Targoviste for the third IP, the town of Floresti, and turned to the southeast too soon. This took them straight toward Bucharest, not Ploesti. At this point, crew members in other planes in this grouping broke radio silence to utter short messages such as, "Mistake" or "Not here, not here!", but this had no effect on the lead plane (3:164). Some, realizing that the course was wrong, tried to break formation. But because of tight formation and minimal wing spacing, they could not maneuver.

Finally, the 93rd pulled abruptly out of formation, and headed back north to Ploesti, determined to salvage a target. They approached the city from the opposite direction as planned, flying over completely unfamiliar territory.

By the time the 376th realized that they had made a wrong turn they were within visual range of Bucharest. They quickly headed north to Ploesti in time to see the 93rd subjected to heavy defensive fire from the densely fortified southern rim of the town. As they approached, BGen Ent in the 376th lead plane released his planes from their briefed objectives and ordered them to hit targets of opportunity. Most planes swerved back to the east to avoid the heavy flak, but one group of five Liberators headed directly into the inferno. They located an important

refinery that remained untouched and headed directly for it. They ran headlong into planes of the 93rd leaving the target area, but were still able to avoid collision with them and place their bombs on the Concordia Vega refinery. The planes of the 376th that had skirted the chaos hit mostly unbriefed targets or just dropped their bombs on the northwest side of Ploesti. Here they met the remnants of the 389th returning home from their attack on the refinery at Campina.

Meanwhile, the 44th and 98th Bomb Groups had accomplished their attack as planned. They had made the correct turn at Floresti and had approached the town from the northwest. Enroute to Ploesti, they followed a railroad track into the city. A camouflaged flak-train on the tracks opened fire on the planes from both sides. The train locomotive was blown up, but not before it had crippled several planes. These planes were still able to drop their bombs on the targets, but were unable to make it back to a recovery base and had to crash land.

The main problem with the raid was that by the time the 44th and 98th planes arrived over their targets, the 93rd and part of the 376th planes had already been there and smoke, fire, and the delayed fused bombs dropped by them threatened their planes. The fires generated by the previous bombings were particularly bothersome since they had the dual effect of adding unpredictable turbulence, and producing dense smoke that hid obstructions like chimneys and barage balloon cables.

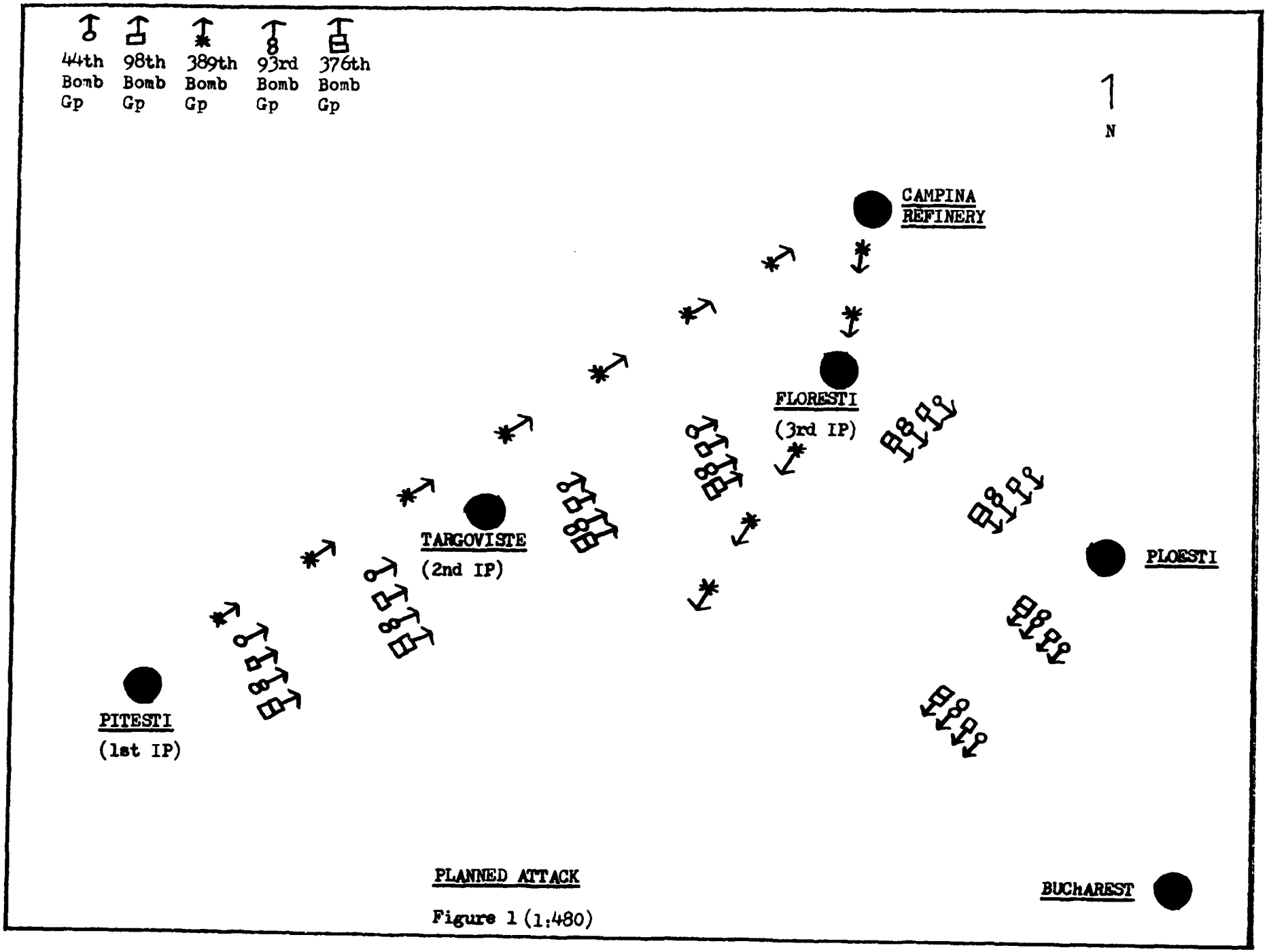
Some of the most valiant action of the raid came in the midst of this chaos. Since their targets had been hit, the 44th and 98th groups could have broken off the engagement and gone home. The leaders, however,

said that they, "had agreed ahead of time that we weren't going that far without trying to get our targets." (3:168) One crew member said it was like flying through hell as he described the action: "Fire wrapped us up. I looked out of the side windows and saw the others flying through smoke and flame." (3:168) Another said, "We flew through sheets of flame, and airplanes were everywhere, some of them on fire and others exploding. It's indescribable to anyone who wasn't there." (3:168) Only 26 of the 57 planes that attacked Ploesti from the briefed direction survived the run. And those 26 had yet to face heavy fighter attacks leaving the target area. The enemy planes used were Messerschmitt(ME)-109's and they were piloted by Germans, not bored Rumanians that initial intelligence had indicated.

The 389th Bomb Group that had broken off at the first IP to singly attack the separate refinery at Campina had a relatively uneventful run. Of the 29 attacking planes, a modest six were lost. This group was the greenest of the five that took off that morning. They were given the separate target for two reasons. The first was that they were flying newer made B-24's with greater range and the separate target was a slightly longer distance than the main targets. In addition, some of these new planes had ball gun turrets on the bottom which would increase their drag and possibly slow them down from the main force. Since timing was a less critical factor in attacking the separate target these planes were chosen to make this attack.

The toll for this mission was very high. Of the 164 planes that made it to the target, 41 had been lost in combat and the final death

toll came to 310. Unfortunately, the results were indecisive. LGen Brereton initially thought that 60 percent destruction of the target had been achieved. In reality it was closer to 40 percent, putting out some facilities for four to six months. But the Germans were able to use Slav captives to clear the rubble and begin rebuilding immediately. Full quotas of oil were being shipped in a matter of days. One German expert, when surveying the damage said that the bombs dropped were too small to do the necessary damage and that many of them had failed to explode. But he did concede that a low-level attack was a good, effective idea if the flight to the target is of short duration. A six hour flight, he felt, stood too great a chance of detection (5:19).



PLANNED ATTACK

Figure 1 (1:480)

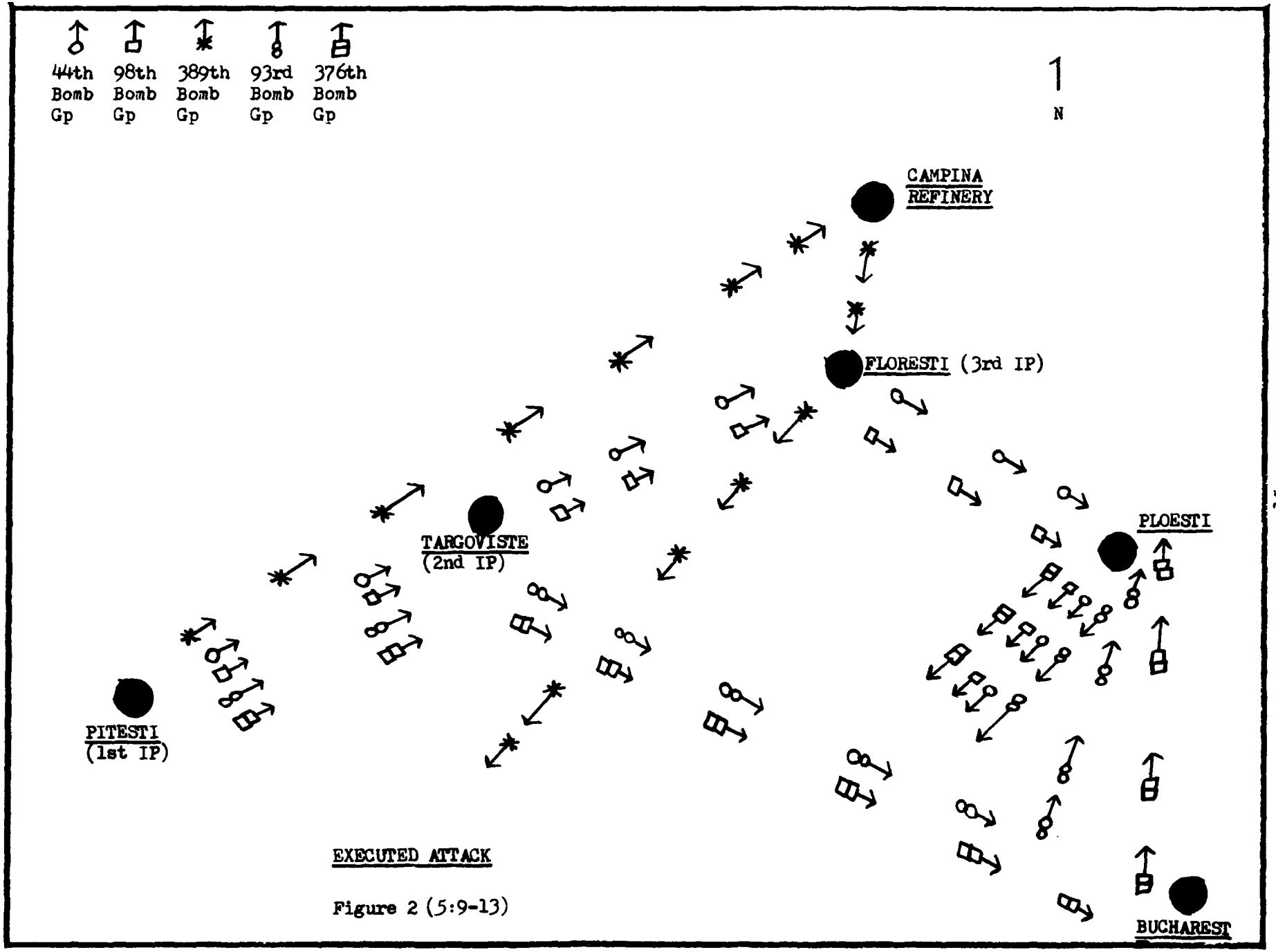


Figure 2 (5:9-13)

Chapter Three

ANALYSES OF PRINCIPLES OF WAR

In analyzing the Principles of War listed in Air Force Manual (AFM)1-1, I will first list the Principle of War and then restate the doctrine pertaining to that principle. Then I will give examples of how the Americans and the Nazis applied or violated these principles during "Operation Tidal Wave", the American bombing of the Ploesti, Rumania Oil Complexes, on 1 August 1943.

PRINCIPLE #1 - OBJECTIVE

> The most basic principle for success in any military operation is a clear and concise statement of a military objective. The objective defines what the military action intends to accomplish and normally describes the nature and scope of an operation. An objective may vary from the overall objective of a broad military operation to the detailed objective of a specific attack. The ultimate military objective of war is to neutralize or destroy the enemy's armed forces and his will to fight. However, the intimate bond which ties war to politics cannot be ignored. War is a means to achieving a political objective and must never be considered apart from the political end. Consequently, political imperatives shape and define military objectives. It follows that the objective of each military operation must contribute to the overall political objective.
>
> Success in achieving objectives depends greatly on the knowledge, strategy, and leadership of the commander. The commander must ensure that assigned forces are properly used to obtain the objective. This requires that objectives be disseminated and fully understood throughout the appropriate levels of command. Clear and concise statements of objective greatly enhance the ability of subordinates to understand guidance and take appropriate actions (11:2-4).

Americans

In attacking the Ploesti oil complexes, the American objective was clear cut, well defined, and directly related to crippling Germany's ability to wage war. It was approved indirectly by President Roosevelt and Prime Minister Churchill at the Casablanca Conference in January 1943 in the form of a target priority list. The priorities, listed in order of importance, were

1. German shipping construction yards,
2. aircraft industry,
3. transportation,
4. oil installations, and
5. other targets in German war industry (3:154).

LGen Lewis H. Brereton, the 9th Air Force Commander, also stated the objective very clearly in his pre-raid briefing to the bomb crews:

> Rumanian oil wells produce approximately 5.5 million tons of crude petroleum products per year. This represents approximately 33 percent of all of the petroleum products available to the European Axis. German armies on the Russian front and German and Italian armies fighting our own troops in Italy are almost entirely dependent upon Rumanian oil. The sudden, complete and permanent denial of Rumanian oil will inevitably result in the collapse of German hope for a successful offensive against Russia and a successful defense against our invasion of Italy. The complete destruction of Rumanian oil refineries this month, with follow up attacks on other related objectives, might well bring an end to the European war six months to a year earlier than can otherwise be anticipated (7:2).

The overall political and military objective in Europe was unconditional surrender and this could only be achieved by denying the Germans the ability to wage war. A successful raid on Ploesti was to have been

a big step in that direction.

Germans

Likewise, the Germans had a very well defined objective at Ploesti, and that was to keep the oil production going. Without Ploesti's oil, the German military machine would be severely hampered. In order to insure that the oil flow would continue the Germans took several innovative steps. They constructed a pipeline connecting all of the refineries in the area so that surviving units of partially damaged plants could be mated with parts of others to keep production going. They also only used 60 percent of Ploesti's capacity, leaving themselves a cushion of 40 percent unused production (5:3). In addition, Ploesti was one of the most heavily defended Nazi targets, having more flak guns surrounding it than Berlin itself. All of these passive and active defense measures illustrate the importance of this oil to the German War effort.

PRINCIPLE #2 - OFFENSIVE

> Unless offensive action is initiated, military victory is seldom possible. The principle of offensive is to act rather than react. The offensive enables commanders to select priorities of attack, as well as the time, place and weaponry necessary to achieve objectives. Aerospace forces possess a capability to seize the offensive and can be employed rapidly and directly against enemy targets. Aerospace forces have the power to penetrate to the heart of an enemy's strength without first defeating defending forces in detail. Therefore, to take full advantage of the capabilities of aerospace power, it is imperative that air commanders seize the offensive at the very outset of hostilities (11:2-5).

Americans

The Americans, without a doubt, had the offensive throughout the battle.

They took the battle to the enemy. They had chosen the time, place and weaponry to be used in the attack. Of course, even though the place of attack was fixed, they still selected the time and ordinance configuration to maximize their effort. The attack was made on a Sunday, while many defenders, including the commanding general, were away from their posts. In addition, the attack was made at noon since the smoke screens used by the defenders wouldn't be as effective at that time of day (10:1). The bomb loads consisted of 1000 lb. and 500 lb. demolition bombs with delayed fuses. The planned bomb delivery was to have consisted of three waves of planes. The bombs carried by the first and second waves were delayed from one to six hours. This would allow the last wave to drop it's load of 45 second delayed bombs without being affected by the explosions caused by the bombs dropped by the first two waves (1:479). Unfortunately, the timing of the attack was disrupted and this resulted in numerous planes flying through fires caused by explosions from previously dropped bombs. In addition to the main, overall offensive, there were also instances of individual offensive actions. Several crews, when shot up on their bomb runs, deliberately dove their aircraft "Kamikaze style" into targets rather than seek escape (6:199). Perhaps the most courageous example of individuals taking the offensive occurred when the 44th and 98th groups arrived at their targets after the targets had already been hit. Instead of immediately fleeing the German defenses, some crews pressed on and tried to hit targets of opportunity in the midst of heavy defensive fire in order to maximize the destruction to the oil facilities (3:168).

Germans

The German defenders spent most of the battle in defensive posture, responding to the American offensive. The only time they were able to take the offensive was in their efforts to destroy mostly crippled B-24's as they left Ploesti. To do this they coordinated two fighter ambushes. The first attack was conducted by Bulgarians in six obsolete ME-109's and resulted in no losses. The second attack was planned by a German fighter controller in Athens. The controller knew that if past history held true, U. S. bombers would probably return to base by the same route they took to the target. So he sent 10 Messerschmits equipped with belly tanks to the closest interception point to engage the B-24's as they returned home. They were able to shoot down four of the 12 American planes while losing only two of their own (5:14).

PRINCIPLE #3 - SURPRISE

> Surprise is the attack of an enemy at a time, place, and manner for which the enemy is neither prepared nor expecting an attack. The principle of surprise is achieved when an enemy is unable to react effectively to an attack. Surprise is achieved through security, deception, audacity, originality, and timely execution. When other factors influencing the conduct of war are unfavorable, surprise may be the key element in achieving the objective. The execution of surprise attacks can often reverse the military situation, generate opportunities for air and surface forces to seize the offensive, and disrupt the cohesion and fighting effectiveness of enemy forces. Surprise requires a commander to have adequate command, control, and communications to direct his forces, accurate intelligence information to exploit enemy weaknesses, effective deception to divert enemy attention, and sufficient security to deny an enemy sufficient warning and reaction to a surprise attack (11:2-5).

Americans

Surprise was an absolute necessity in order to successfully attack

the Ploesti targets. The mission planners recognized this from the beginning and discussed it in mission planning documents. They realized, however, that they would probably not be able to achieve total surprise in the sense that they would be unable to reach the target area before the enemy had been alerted. The Americans wanted to maximize the shock the Germans would feel when they realized the attack was at low-level instead of the expected high-level tactic. The planners felt that the low-level bomb run would inhibit the effectiveness of the German defenses (8:1). It turned out, however, that the defenses were much stronger than the Allies expected and proved very successful against the B-24's. The loss to AA was at least 18 of 163 planes that made it over target (12:30).

There is evidence that the Germans knew of the take-off of the B-24's from Libya. The Luftwaffe signals interception battalion picked up and decoded the routine take-off signal and alerted Gerstenberg's defensive network. Although they did not know the destination of the formation they knew something was going on. A short while later, the defenders knew the direction and cruise altitude of the bombers and began their defensive preparations (5:7).

By the time they realized the planes were attacking from tree-top level, they only had minutes to alter the fuse settings on their guns. However, most gun crews were able to do this rapidly (5:7). This fact combined with the heavy concentration of guns made the defensive effort more formidable than expected.

Ironically, in an attempt to preserve secrecy the Allies did not

conduct any photo-reconnaissance of the target area prior to the raid (5:4). This turned out to be a fatal mistake that caused them to grossly underestimate the strength of the German defenses.

Germans

Ploesti held many surprises for the attackers. Most of these were due to poor or non-existent intelligence. The most devastating surprise was that Ploesti had 237 heavy anti-aircraft guns ringing it, where allied intelligence had only estimated 80. In addition, there were many machine guns hidden in pits, haystacks and church steeples. Whereas intelligence indicated the AA was concentrated in the east, in reality it was concentrated in the southwest. Instead of being manned by soft, inexperienced Rumanians, most guns were expertly manned by skilled, battle-hardened Germans.

One of the most ingeneous ways the Germans employed surprise was in their use of a "Q-train". The "Q-train" was a self-contained air defense system hidden in collapsable box cars. In addition to the armed cars, the train boasted crew bunk cars, a kitchen, a recreation room and freight cars with extra ammunition. When the Germans had predicted that the flight path of a portion of the planes would bring them very close to the railroad, they began running the train back and forth, waiting to ambush the unsuspecting planes. It couldn't have worked out better for the Germans. The B-24's flew parallel to the track with one column on each side. As the planes overtook the train at tree-top level, the box cars collapsed and the guns opened fire from both sides. The formation could not take evasive action without losing the bomb run. The locomo-

tive was blown up, but not before eight of 57 planes were hit (2:148).

PRINCIPLE #4 - SECURITY

> Security protects friendly military operations from enemy activities which could hamper or defeat aerospace forces. Security is taking continuous, positive measures to prevent surprise and preserve freedom of action. Security involves active and passive defensive measures and the denial of useful information to an enemy. Security protects friendly forces from an effective enemy attack through defensive operations and by masking the location, strength and intentions of friendly forces. Security in aerospace operations is achieved through a combination of factors such as secrecy, disguise, operational security, deception, dispersal, maneuver, timing, posturing, and the defense and hardening of forces (11:2-5).

Americans

The Americans took extensive, elaborate steps to insure the security of the mission. A tight shroud of secrecy surrounded the training that preceeded the attack. In order to confuse the enemy, an intelligence cover plan was adopted that called for circulating rumors among the crews that their low-level training was to be utilized in an upcoming raid on Rome. This was logical since low-level techniques would be needed to insure that the many Vatican buildings spread throughout the city would not be damaged. Rumors also said that the target might be Italian hydroelectric dams or even Hitler's private retreat at Berchtesgaden (9:1;6:190). Additionally, the crews were to maintain strict radio silence, once the mission was launched. The planners felt that there was a good chance that the planes would not be detected until close to the target area, so the observance of radio silence would preserve security for as long as possible. In reality, however, the silence served no purpose. The planes were detected long before radio silence was broken. And, ironi-

cally, because of the silence, the leaders were unable to reunite their planes after they were separated by weather on the way to the target. This prevented the co-ordinated attack that the operations plan called for. Additionally, one of the groups made a wrong turn on the way in. The radio silence rule prevented the following planes from contacting the lead plane and getting it to correct its' course (5:19).

Germans

The German commander, General Gerstenberg, implemented a variety of measures to bolster Ploesti's security. The first step was to virtually seal-off Ploesti by ridding the city of suspicious and non-essential personnel. He also forced his soldiers to report virtually all contacts with Rumanian citizens. He would use this information to attempt to identify and penetrate espionage rings. Defenses under construction in Ploesti were usually hidden from public view and false intelligence that Gerstenberg wanted communicated to the Allies was circulated in the city's cafes and bistros (5:6).

PRINCIPLES #5 AND #6 - MASS AND ECONOMY OF FORCE

> Success in achieving objectives with aerospace power requires a proper balance between the principles of mass and economy of force. Because of their characteristics and capabilities, aerospace forces possess the ability to concentrate enormous decisive striking power upon selected targets when and where it is needed most. Concurrently, using economy of force permits a commander to execute attacks with appropriate mass at the critical time and place without wasting resources on secondary objectives. Commanders at all levels must determine and continually refine priorities among competing demands for limited aerospace assets. This requires a balance between mass and economy of force, but the paramount consideration for commanders must always be the objective. Expending excessive efforts on secondary objectives would tend to dissipate the strength of aerospace forces and possibly render them incapable of achieving the primary objective. Economy of force helps to preserve the strength

of aerospace forces and retain the capability to employ decisive firepower when and where it is needed most (11:2-6).

Americans

There is evidence that the Americans did a fairly good job of balancing the opposing concepts of mass and economy of force in the planning of the raid. As far as applying mass is concerned, they planned to use it to concentrate firepower, produce a shock effect and disrupt the concentration of defending gunners.

The B-24's were formed in basic three-plane "V" formations, the arrangement that made the most effective use of the 10 guns that each plane carried (2:89). Much of the effect of mass was lost, however, when the planes became separated on the way to the Ploesti. As a result, what was to have been a massed formation over most of the targets turned into smaller separate formations (3:163).

The sight of so many planes attacking in mass at low-level was to have also had a negative morale or "shock" effect on the enemy AA gunners, many of whom were thought to be Rumanians that would flee for cover or freeze under such an intimidating sight. In reality, most guns were manned by highly effective, tenacious German troops (8:2).

A negative result of employing planes in this formation was that this restricted their maneuverability. This lack of maneuverability proved all the more costly when the timing of the raid was disrupted by the navigation errors.

Economy of force was also employed from the very outset of the

Americans planning. In the first place, they didn't have enough planes to hit all 12 refineries that ringed Ploesti. Seven major refineries were selected as targets. This was the minimum number that the Americans had to hit and still do the necessary damage to the production capacity(2:37). In addition, every single bomb was critical to mission accomplishment. Crippling a refinery required the destruction of small, critical targets within the refinery complex such as pumping stations, stills, cracking towers, boiler houses and power houses. To complicate matters these critical points were widely dispersed and surrounded by blast walls in order to improve survivability. It was believed that the bombs of all of the attackers could have been dropped on one refinery and, if not properly placed, still fail to destroy its' production capacity (2:37).

Germans

Instead of balancing the principles of mass and economy of forces as the Americans had planned to do the Germans opted heavily for the principal of mass. Economy of force was not evident at Ploesti. The German commander, General Gerstenberg, used his long-time friendship with Herman Goering as leverage to acquire the increased numbers of men and equipment needed to transform Ploesti into a "colossal land battleship, armored and gunned to withstand the heaviest aerial attack." (2:34) Specifically, Ploesti had been fortified with the following equipment which was engaged in action during the raid (5:3):

237 anti-aircraft guns (88mm, 37mm and 20mm)

250 (approx) planes (ME-109's and 110's, JU-88's, JU-87's and others)

100 (approx) blocking balloons, some rigged with explosives

On top of this, there were hundreds of machine gun pits and towers. Additional guns were well hidden in haystacks and groves and mounted on factories, bridge approaches, church steeples and water towers.

The main German fighter base was at Mizil, some 20 miles east of Ploesti. There were four wings of ME-109's for a total of 52 aircraft. There was a smaller German fighter base at Zilistea, a few miles further east than Mizil. Here there were 17 twin engine ME-110 night fighters. Also nearby were some 54 Rumanian planes of older vintage. In addition, there were around 150 more planes constituting the outer fighter ring. The fact that Gerstenberg had so many fighters detailed to him at a time when Germany was suffering massive around-the-clock bombing from Britain was remarkable and totally unexpected by Allied planners. In short, the Germans were well equipped, ready and waiting for the Ploesti raid.

PRINCIPLE #7 - MANEUVER

> War is a complex interaction of moves and countermoves. Maneuver is the movement of friendly forces in relation to enemy forces. Commanders seek to maneuver their strengths selectively against an enemy's weakness while avoiding engagements with forces of superior strength. Effective use of maneuver can maintain the initiative, dictate the terms of engagement, retain security, and position forces at the right time and place to execute surprise attacks. Maneuver permits rapid massing of combat power and effective disengagement of forces. While maneuver is essential, it is not without risk. Moving large forces may lead to loss of cohesion and control (11:6).

Americans

Maneuver was not a positive factor on the American side. By the time the planes arrived over Ploesti all semblance of order and discipline had evaporated. Because of the navigational errors, the plan of attack was completely disrupted. The resulting battle was confusing, with crews

navigating unfamiliar terrain and dropping their bombs on unfamiliar targets. Because the planes were flying at low-level in tight formations, pilots had little room to maneuver. And their flexibility was further hampered by the blinding smoke and explosions they were flying into, as well as the blocking balloons. Lateral movement was also restricted because the planes were lower than the smokestacks that dotted the target area.

Germans

Maneuver was not a factor on the German side of the battle.

PRINCIPLES #8 AND #9 - TIMING AND TEMPO

> Timing and tempo is the principle of executing military operations at a point in time and at a rate which optimizes the use of friendly forces and which inhibits or denies the effectiveness of enemy forces. The purpose is to dominate the action, to remain unpredictable, and to create uncertainty in the mind of the enemy. Commanders seek to influence the timing and tempo of military actions by seizing the initiative and operating beyond the enemy's ability to react effectively. Controlling the action may require a mix of surprise, security, mass, and maneuver to take advantage of emerging and fleeting opportunities. Consequently, attacks against an enemy must be executed at a time, frequency, and intensity that will do the most to achieve objectives (11:2-6).

Americans

The American plan placed great emphasis on proper timing and tempo in the Ploesti raid. The individual elements were to hit seven refineries from two different points of the compass at precisely designated times (4:157). The planners knew that this was crucial to success. But after the planes became separated, once by weather and again by navigational error, all timing and tempo was lost. A complicating factor to the weather separation was that while the grouping at 16,000 feet was being pushed by tail winds,

the grouping at 12,000 feet was being held up by head winds (4:159).

Once over the target, the first wave was to drop delayed fused bombs that would not detonate until subsequent waves had passed. Because the timing was off, and B-24's were coming at each other from opposite directions, some planes went down when delayed fused bombs went off. Obstacles such as blocking balloons, smokestacks, dense smoke and heavy ground fire prevented regaining tempo once the battle was underway.

Germans

Timing and tempo was not a factor on the German side of the battle.

PRINCIPLE #10 - UNITY OF COMMAND

> Unity of command is the principle of vesting appropriate authority and responsibility in a single commander to effect unity of effort in carrying out an assigned task. Unity of command provides for the effective exercise of leadership and power of decision over assigned forces for the purpose of achieving a common objective. Unity of command obtains unity of effort by the coordinated action of all forces toward a common goal. While coordination may be attained by cooperation, it is best achieved by giving a single commander full authority (11:2-6).

Americans

Unity of command was a concept that was supported and planned for by the Americans and initially put into practice by sending BGen Ent on the raid as the mission commander. However, because of the radio silence rule, Ent was ineffective in this role because he could not control the actions of the other airplanes. He was unable to prevent the separation of the planes as they crossed the mountains or correct the wrong turn made at Targoviste. His only command decision occurred when he ordered the 376th Bomb Group to break off its bomb run and hit targets of oppor-

tunity (2:139).

Germans

Unity of command was also practiced on the German side. The fighter defense was conducted from the fighter control center in Ploesti by Capt Douglas Pitcairn. Fighter pilots were sitting cockpit alert and were able to launch quickly when Pitcairn ordered them to.

Additionally, fearing that German airfields might also be targets, the fighter controller ordered all German planes into the air for survivability. This order was carried out quickly and successfully (2:110).

The command and control system under Pitcairn was able to effectively redirect the fighter effort from just north of Floresti to the southwest of Ploesti, to engage the rest of the 93rd Bomb Group after they had dropped their bombs and were heading home.

PRINCIPLE #11 - SIMPLICITY

> To achieve a unity of effort toward a common goal, guidance must be quick, clear, and concise - it must have simplicity. Simplicity promotes understanding, reduces confusion, and permits ease of execution in the intense and uncertain environoment of combat. Simplicity adds to the cohesion of a force by providing unambiguous guidance that fosters a clear understanding of expected actions. Simplicity is an important ingredient in achieving victory, and it must prevade all levels of a military operation. Extensive and meticulous preparation in peacetime enhances the simplicity of an operation during the confusion and friction of wartime. Command structures, strategies, plans, tactics, and procedures must all be clear, simple, and unencumbered to permit ease of execution. Commanders at all levels must strive to establish simplicity in these areas, and the peacetime exercise of forces must strive to meet that same goal (11:2-7).

Americans

The Americans sought to make the attack as simple as they could. The mechanics of the attack were for 4 of the 5 bomb groups to hit Ploesti from the northwest, following a railroad from the last IP into the heart of the targets (2:43). This would allow them to drop low for the final bomb run knowing absolutely that they were headed for their targets.

Extensive, innovative training techniques prior to the raid also aided simplicity. For instance, the planners realized that one drawback of flat aerial maps is that they don't coordinate with ground features until the airplane is directly over them. To correct this, a novel technique was developed to construct oblique drawings to show the crews how landmarks should look as they approached them (2:45). Another example was the production of a motion picture to be used to brief the bomb crews on the Ploesti mission (2:75). This was the first time that a movie had been used for this purpose. Additionally, the crews were subjected to extensive training flying at low-level over a scale model of the target area. This training was absolutely necessary to make the crews comfortable with the new technique of low-level flying. As Col John R. Kane recalled:

> During our practice runs on the dummy targets, we found that many of our pilots instinctively refused to endanger their planes by flying on the deck in the prop-wash of preceding planes . . . We spent hours on lectures and demonstrations trying to drive home to pilots that they had to fly low and stay low (4:157).

This repetetive, detailed practice was essential to making the attack simple.

Germans

The Germans also valued the principle of simplicity in defending Ploesti. The defenses were basic, straightforward and redundant. The city was ringed with mobile guns that could be shifted as needed. There were a total of 237 guns most of them manned by well-trained, well-led Germans. There was an inner ring of some 143 fighters that could back up an outer ring consisting of even more planes.

The warning systems were also simple and redundant consisting of visual spotters, radars, radio intercept points and visual spotter planes. All these detectors reported by direct phone to Gen Gerstenberg's control center, where there were some 120 specialists on duty at all times to help organize a defense of Ploesti.

The Germans also believed in the value of training of contingencies in order to make the "real thing" simpler. For several months prior to this attack, they ran surprise mock attacks with actual planes coming overhead. Each day flak gunners were subjected to these drills (5:5).

PRINCIPLE #12 - LOGISTICS

> Logistics is the principle of sustaining both man and machine in combat. Logistics is the principle of obtaining, moving, and maintaining warfighting potential. Success in warfare depends on getting sufficient men and machines in the right position at the right time. This requires a simple, secure, and flexible logistics system to be an integral part of an air operation. Logistics can limit the extent of an operation or permit the attainment of objectives. The information, mechanics, and decisions, required to get men, machines and their required material where and when they are needed is extensive and demanding.
>
> Effective logistics also requires a flexible system that can function in all combat environments and that can respond to abrupt and sudden change. For example, if weather or enemy

> activities force a move in operating locations, sustaining an air operation may depend on a logistics system that can respond to that exigency. Therefore, in preparing for war, air commanders must establish and integrate a logistics system that can keep pace with the requirements of air operations in combat. This requires a flexible logistics system that is not fixed, and one that can provide war-fighting potential when and where it is needed (11:2-7).

Americans

The Americans had to contend with many logistics challenges in order to undertake the novel technique of a long, low-level bombing mission. To begin with, the planes had to be configured with belly tanks in order to acquire the range needed to bomb Ploesti (5:2).

Another logistics problem that had to be overcome concerned the need to have new engines for the raid. Because of the desert sand in Libya, the Pratt and Whitney engines only had a life of 60 hours. Under normal conditions the engines would have lasted for at least 300. The engines on the planes had been repaired many times and the mission leaders felt that new engines were necessary for the 2,300 mile round trip to Ploesti. Three hundred new engines to be shipped from the CONUS would have overloaded the capacity of the Air Transport Command. As an alternative, Britain supplied a ship to bring the engines straight to Libya. They arrived two days before the mission and mechanics spent 48 straight hours to install them in time for the mission (2:67).

Another logistics episode was handled very cheaply and innovatively by the Americans. The Norden bombsights that the B-24's were normally equipped with were ineffective at low-level. Therefore, converted gun-sights were substituted to do the job (2:62).

Finally, escape kits for the flyers were developed in case they were downed on the mission. The kits contained a handkerchief, map of the Balkans, a Gold Sovreign, 10 one-dollar bills, local currency, pressed dates, water purification tablets, biscuits, sugar cubes and chocolate (2:79).

Germans

The German logistic effort at Ploesti was well developed and effective. For example, Gerstenberg had developed a plan to keep a corridor open from Ploesti in case the Rumanians rebelled. This plan would enable him to perform the key logistics functions of receiving supplies from and shipping oil to Germany (2:29).

Another example of his concern with logistics was his above ground pipeline connecting all the refineries. This enabled undamaged parts of refineries to be connected to other refineries and allow the production of oil to be quickly resumed. And the fact that the pipe was above ground made it easier to repair (5:3).

PRINCIPLE #13 - COHESION

> Cohesion is the principle of establishing and maintaining the warfighting spirit and capability of a force to win. Cohesion is the cement that holds a unit together through the trails of combat andis critical to the fighting effectiveness of a force. Throughout military experience, cohesive forces have generally achieved victory, while disjointed efforts have usually met defeat. Cohesion depends directly on the spirit a leader inspires in his people, the shared experiences of a force in training or combat, and the sustained operational capability of a force. Commanders build cohesion through effective leadership and generating a sense of common identity and shared purpose. Leaders maintain cohesion by communicating objectives clearly, demonstrating genuine concern for the morale and welfare of their people, and employing men and machines according to the dictates of sound military doctrine. Cohesion in a force is produced over time through effective leadership at all levels of command (11:2-8).

Americans

Cohesion was evident among all five bomb groups and within each bomb group. Overall cohesion was bolstered by LGen Brereton's final briefing:

> . . . . today as I saw your 175 four-engined bombers come roaring across the African desert at 50 feet altitude, bringing dust from the ground with your mighty roar, I enjoyed the great thrill of my entire life. Tomorrow, when you advance across that captured country, you will tear the hearts out of them. You are going in low-level to hit the oil refineries, not the houses, and leave your powerful impression on a great nation. The roar of your engines in the heart of the enemy's conquest will sound in the ears of the Rumanians - and yes, the whole world - long after the blasts of your bombs and fires have died away (2:69).

Cohesion was evident at numerous times throughout the battle. For example, Col Addison Baker led the 93rd Bomb Group toward its target in the face of heavy fire, even after he had dropped his bomb load and could have fled from the concentrated ground fire. Also, when BGen Ent released the planes of the 376th to hit targets of opportunity, Maj Norman Appold pressed on through heavy fire, leading his five planes to hit an undamaged refinery.

Perhaps Col John "Killer" Kane summed up the depth of the American's cohesion when he said, "our attack was as deserving of poetic immortality as the Charge of the Light Brigade" (4:162).

Germans

The Germans also emphasized cohesion in their strategy. Gerstenberg saw to it that he got only the best in men and material. He trained his men incessantly and had developed his troops into a competent, highly motivated team that handled the defense of Ploesti well (5:4).

Chapter Four

SEMINAR GUIDANCE

Lead Off Question

As you have seen, the raid on Ploesti was a novel, innovative idea in that the B-24 was not designed with low-level bombing in mind and had never been used in a low-level mode. With this in mind, what was the single principle of war that most likely determined the success or failure of the mission?

Discussion

There's no clear answer on this one. Like beauty, it's all in the eyes of the beholder and how well he justifies his position. Clearly, though, the principles of surprise, security and timing and tempo were important considerations. Surprise was touted by the planners as the key element in the raid in that it would prevent the Germans from reacting effectively to the attack. But, the Germans were able to react in time (they quickly adapted to the low-level targets and didn't abandon their gun positions as the Americans had speculated) and were more effective than the Americans thought they would be. If the surprise had been total, perhaps the Americans would have been more successful.

Security is closely related to the concept of surprise in that it is listed as a means of achieving surprise. But, in spite of the radio

silence edict (a strict security measure), the Americans were still detected heading in the direction of Ploesti. And the timing and tempo of the raid was completely disrupted, resulting in planes flying directly toward each other, making it virtually impossible to recognize and hit briefed targets.

Follow Up Question

Was the radio silence edict imposed on the Ploesti attack force really necessary?

Discussion

In retrospect, it doesn't seem so. In the first place, they were detected by radar and visual spotters long before the radio silence edict was violated when the 376th and 93rd Bomb Groups made the wrong turn at Targoviste. Secondly, had the planes been allowed to communicate with each other, the wrong turn would probably have been corrected and the force would have bombed on the briefed course in a united formation, as had been planned.

Follow Up Question

So, if the American planes had been allowed to communicate with each other from the very beginning, the mission would have been more successful?

Discussion

Not necessarily! Here the old "fog of war" comes into play. The Germans positioned their fighters over the town of Floristi in an attempt to intercept the B-24's. Because the 376th and 93rd Bomb Groups made the wrong turn and attacked Ploesti from the southeast, the fighters

were redirected to their position. Ironically, this movement allowed the 44th and 98th Bomb Groups to bomb as planned without any fighter opposition. If the wrong turn had not been made, all four groups would have had to fight their way through the German fighters before dropping their bombs on their targets.

Question

Intelligence has been listed as a principle of war in the past by numerous authorities. The draft AFM 1-1, does not treat it as a separate principle, but instead addresses it within the context of the broader principles of surprise and security. In view of the Ploesti raid, should intelligence be added to the current "Principles of War"?

Discussion

Certainly a case can be made for the importance of intelligence on the Ploesti mission. For one thing, a lack of good,solid intelligence led to the unnecessary radio silence rule and the Americans inability to assess the Germans heavy defenses and radar capabilities. Experts believe that aerial photo reconnaisance would have alerted the Americans to the heavy flak and balloon emplacements resulting in the postponement or reevaluation of the mission. You can't get much more critical than that.

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